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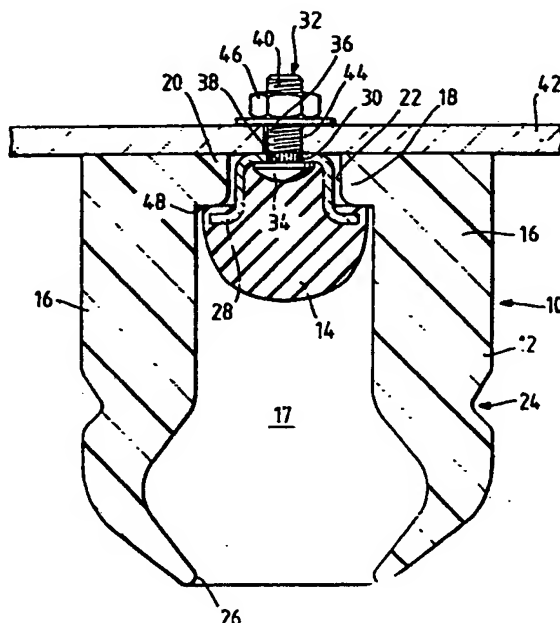
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(57) A suspension bumper (10) for the suspension system of a vehicle comprises a spring assister (12) of polyurethane or other suitable elastomeric material having walls (16) defining a substantially hollow cylinder (17), and a base (18) substantially closing one end (20) of the hollow cylinder, the base having an aperture (22) therethrough; and a bump stop (14) of rubber or other suitable elastomeric material which can be positioned inside the hollow cylinder to engage the inner surface (48) of the base, the bump stop being secured to one end of a longitudinally extending shank (36) which can pass through the aperture (22) for securing the spring assister and the bump stop to the vehicle (42).

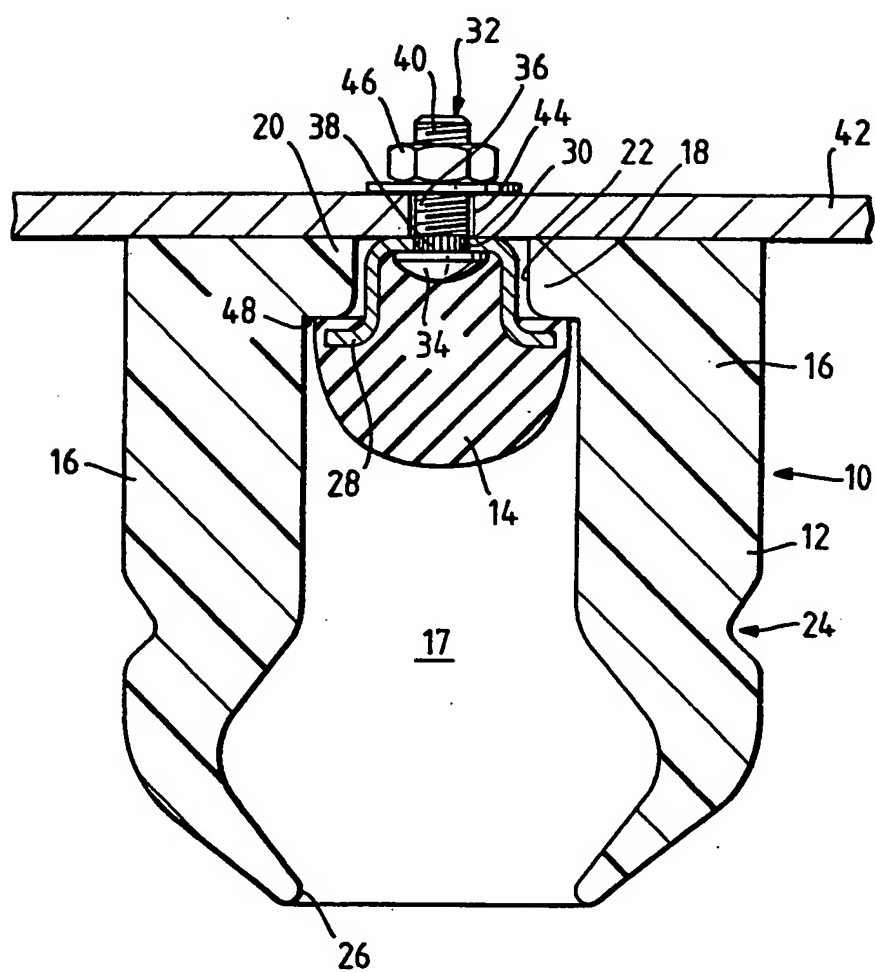
Fig. 1.



At least one drawing originally filed was informal and the print reproduced here is taken from a later filed formal copy.

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Fig. 1.



SUSPENSION BUMPER

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This invention relates to a suspension bumper for the suspension system of a vehicle, and more particularly to a suspension bumper for a heavy goods vehicle (over 5 tonnes).

- 5 It is known to provide, on the suspension system of a vehicle, a spring assister for the main spring of the suspension system. Such spring assisters are positioned between, and are engageable by, an unsprung portion and a sprung portion of the vehicle. The spring assisters
- 10 have a low hysteresis and act to modify the spring rate of the main spring of the suspension system. Early versions of spring assisters were made of rubber, as for example shown in GB patent no. 940,684. More recent developments include the use of polyurethane which has
- 15 better hysteresis and damping properties, and an example of such a spring assister is disclosed in GB patent no. 952,113. In order to fasten rubber spring assisters to a vehicle a metal fastening plate was usually bonded to the rubber material. This method is not possible with
- 20 polyurethane (there is no known suitable bonding material), and the metal fastening plate has had to be secured to the spring assisters in other ways. None of these alternative securing methods have been completely successful because of the difficulty in securing, and
- 25 consequent expense, and because the metal fastening plate can limit the amount of compression (of the spring assister) available for damping, thereby compromising the design.

- On vehicles under a heavy load, and in particular on
- 30 heavy goods vehicles, a spring assister on its own will not always have sufficient capacity to prevent the unsprung portion of the vehicle and the sprung portion

of the vehicle engaging one another. It has therefore been the usual practice to include a bump stop as part of the suspension system. The bump stops are usually made of rubber and are separately mounted to prevent
5 engagement of the sprung and unsprung portions of the vehicle. The combination of spring assister and bump stop act to provide, respectively, a progressive slowing of the relative movement of the sprung and unsprung portions towards one another, and a final abutment to
10 prevent engagement. A combination of spring assister and bump stop is shown in GB patent no. 940,684.

It is an object of the present invention to overcome the above mentioned disadvantages.

To this end, a suspension bumper in accordance with the
15 present invention comprises a spring assister of polyurethane or other suitable elastomeric material having walls defining a substantially hollow cylinder, and a base substantially closing one end of the hollow cylinder, the base having an aperture therethrough; and
20 a bump stop of rubber or other suitable elastomeric material which can be positioned inside the hollow cylinder to engage the inner surface of the base, the bump stop being secured to one end of a longitudinally extending shank which can pass through the aperture in
25 the base of the spring assister for securing the spring assister and the bump stop to the vehicle.

The present invention has the advantage that only a single fastening arrangement is required in order to secure both the spring assister and the bump stop to the
30 vehicle. The installation of the spring assister and the bump stop is therefore simplified, and hence is less costly. Where the spring assister is of polyurethane

material, a metal fastening plate for the spring assister is no longer required, and hence the disadvantages associated with such a metal fastening plate (as mentioned above) no longer exist.

- 5 Preferably, the base of the assister spring is formed integrally with the walls.

The longitudinally extending shank preferably has an externally threaded surface for screw threaded engagement with a nut for securing the spring assister
10 and the bump stop to the vehicle. The nut preferably engages a surface of the vehicle. Alternatively, the nut may be securely held by the bump stop.

Preferably, the longitudinally extending shank is secured to a metallic plate, the bump stop being bonded
15 to, or moulded around the metallic plate. In this case, the longitudinally extending shank preferably has splines on a portion of its external surface which can engage in an opening in the metallic plate to secure the longitudinally extending shank thereto.

- 20 The spring assister preferably has at least one circumferentially extending annular groove in the outer surface of the walls, and/or the walls of the spring assister at the open end of the hollow cylinder are preferably narrowed in thickness and directed inwardly,
25 to provide the spring assister with required predetermined spring characteristics.

The present invention also includes a method of securing a suspension bumper as herein described to a vehicle, the method comprising positioning the bump stop in the
30 hollow cylinder of the spring assister, passing the longitudinally extending shank through the aperture in the base of the spring assister, and securing the

longitudinally extending shank to the vehicle such that the bump stop engages the inner surface of the base to secure the bump stop and the spring assister to the vehicle.

- 5 The present invention will now be described, by way of example, with reference to the accompanying drawing in which the sole Figure is a cross-sectional view of a suspension bumper in accordance with the present invention.
- 10 Referring to the drawing, the suspension bumper 10 comprises a spring assister 12 and a bump stop 14, both of which are of conventional design. The spring assister is of polyurethane material and has walls 16 defining a substantially hollow cylinder 17, and a base 18 integral
15 with the walls and substantially closing one end 20 of the hollow cylinder. The base 18 has an aperture 22 therethrough. The walls 16 of the spring assister 12 have an outer, circumferentially extending, annular groove 24 therein. Although only one annular groove 24
20 is shown, there may be more than one if required, or none. The number and size of the annular groove or grooves is selected to provide the spring assister 12 with required predetermined spring characteristics. The walls 16 are narrowed in thickness and directed inwardly
25 at the open end 26 of the hollow cylinder 17 to again provide the spring assister 12 with required predetermined spring characteristics, as is common practice.
- The bump stop 14 is of rubber material bonded to, or
30 moulded around, a metallic plate 28. The metallic plate has an opening 30 therein. A screw 32 having a head 34 and a longitudinally extending shank 36 is secured to

the bump stop 14 with the head positioned on the inner side of the metallic plate 28 and with the longitudinally extending shank extending through the opening 30. Splines 38 on the longitudinally extending shank 36 engage the metallic plate 28 at the opening 30 to prevent rotation of the screw 32 about its longitudinal axis relative to the bump stop 14. As an alternative, the screw may be replaced by a longitudinally extending shank which is welded or otherwise secured to the metallic plate 28 before the bump stop 14 is moulded or bonded thereto. The remainder of the longitudinally extending shank 36 has a screw thread 40 on its outer surface.

When the suspension bumper 10 is fastened to a surface 42 (which may be a sprung or unsprung portion) of a vehicle, the bump stop 14 is positioned inside the hollow cylinder 17 defined by the spring assister 12, with the longitudinally extending shank 36 passing through the aperture 22 in the base 18. The longitudinally extending shank 36 is then passed through an aperture 44 in the surface 42 and is secured by a nut 46. On tightening the nut 46, the bump stop 14 engages the inner surface 48 of the base 18 of the spring assister 12 to secure both the spring assister and the bump stop to the vehicle.

As a further alternative, a captive nut may be held within the bump stop 14, and the screw 32 may be passed through the aperture 22 in the base 18 to threadingly engage the captive nut, with the head 34 of the screw engaging the surface 42 of the vehicle.

The suspension bumper 10 of the present invention may be used in the suspension system described and claimed in our co-pending GB patent application no. ----- (MJD/440) filed the same day as this application.

Claims:-

1. A suspension bumper for the suspension system of a vehicle, the suspension bumper comprising a spring assister of polyurethane or other suitable elastomeric material having walls defining a substantially hollow cylinder, and a base substantially closing one end of the hollow cylinder, the base having an aperture therethrough; and a bump stop of rubber or other suitable elastomeric material which can be positioned inside the hollow cylinder to engage the inner surface of the base, the bump stop being secured to one end of a longitudinally extending shank which can pass through the aperture in the base of the spring assister for securing the spring assister and the bump stop to the vehicle.
2. A suspension bumper as claimed in Claim 1, wherein the base of the assister spring is formed integrally with the walls.
3. A suspension bumper as claimed in Claim 1 or Claim 2, wherein the longitudinally extending shank has an externally threaded surface for screw threaded engagement with a nut for securing the spring assister and the bump stop to the vehicle.
4. A suspension bumper as claimed in any one of Claims 1 to 3, wherein the longitudinally extending shank is secured to a metallic plate, the bump stop being bonded to, or moulded around the metallic plate.
5. A suspension bumper as claimed in Claim 4, wherein the longitudinally extending shank has splines on a portion of its external surface which can engage in an opening in the metallic plate to secure the longitudinally extending shank thereto.

6. A suspension bumper as claimed in any one of Claims 1 to 5, wherein the spring assister has at least one circumferentially extending annular groove in the outer surface of the walls.

5 7. A suspension bumper as claimed in any one of Claims 1 to 6, wherein the walls of the spring assister at the open end of the hollow cylinder are narrowed in thickness and directed inwardly.

8. A suspension bumper substantially as hereinbefore
10 described with reference to, and as shown in, the accompanying drawing.

9. A method of securing a suspension bumper as claimed in any one of the preceding Claims to a vehicle comprising positioning the bump stop in the hollow
15 cylinder of the spring assister, passing the longitudinally extending shank through the aperture in the base of the spring assister, and securing the longitudinally extending shank to the vehicle such that the bump stop engages the inner surface of the base to
20 secure the bump stop and the spring assister to the vehicle.